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ABSTRACT

The sensitivity of enrollment to conditions in the labor market for college graduates was assessed. A model was developed to determine whether sensitivity of enrollment to labor market changes depends on admissions selectivity and the curriculum. Data from 1965-1981 for 64 independent liberal arts colleges in Iowa and Illinois were evaluated. Results indicate that when conditions in the college job market deteriorated: colleges conferring degrees in occupational fields such as business or computer science experienced greater enrollment growth than did colleges offering traditional arts and sciences and teacher training curricula; and colleges with more selective admissions experienced greater enrollment growth than those with less selective admissions. Enrollment at the colleges was significantly related to beginning earnings of college graduates and the population of 18-24 year olds. It is suggested that occupational programs limit the downside risk of declining enrollment when conditions in the labor market deteriorate, but they also limit expansion of enrollments when the labor market improves. The enrollment determination model is detailed using equations. (SW)

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HIGHER EDUCATION ENROLLMENT: THE INTERACTION OF
LABOR MARKET CONDITIONS, CURRICULUM, AND SELECTIVITY

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ABSTRACT

This study specifies a model in which the sensitivity of an institution's enrollment to labor market changes depends on its curriculum and admissions selectivity. OLS estimates were obtained from pooled data for 64 independent liberal arts colleges in Iowa and Illinois from 1965-1981. Results indicate that when conditions in the college job market deteriorated: i) colleges conferring degrees in occupational fields such as business or computer science experienced greater enrollment growth than colleges offering only traditional arts and sciences and teacher training curricula, and ii) colleges with more selective admissions experienced greater enrollment growth than those with less selective admissions.

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INTRODUCTION

A number of recent studies have shown that conditions in the labor market for college graduates (LMCG) influence higher education enrollment.¹ Related studies have identified a number of other factors that appear to affect enrollment.² However, none has considered how the effect of labor market conditions on enrollment might be conditioned by college characteristics. In particular, they have not considered how a college's curriculum and selectivity may affect the sensitivity of its enrollment to fluctuations in the LMCG. The central purpose of this study is to examine this interaction.

The importance of this issue can be seen in the experience of the 1970s. As the LMCG deteriorated there was a major shift in student preferences away from the traditional arts and sciences, such as philosophy and sociology, toward occupational fields of study, such as business and accounting.³ Perhaps in response, many colleges added new high-demand occupational programs and even dropped some less popular traditional arts and sciences programs in an apparent attempt to match more closely their curricular offerings with the new patterns of student demand.⁴

A question suggested by this pattern of response is whether colleges can reduce the vulnerability of their enrollment to labor market conditions by appropriately modifying curriculum. Will an increased emphasis on occupational curricula insulate a college's enrollment from the vicissitudes of the LMCG? A related question is whether a college's selectivity conditions the sensitivity of its enrollment to changes in the LMCG.

To determine how curriculum and selectivity influence the sensitivity of enrollment to conditions in the LMCG, a model of enrollment determination was developed and its parameters were estimated from 1965-81 data on a set of 64 independent liberal arts colleges in Iowa and Illinois.⁵ The next section of this paper describes the model employed, the third section presents results, and the fourth section presents policy implications.

THE MODEL

Enrollment at an independent liberal arts college (ILA) may depend on a number of environmental and institutional factors as well as the earnings expected by its graduates (conditions in the LMCG) and the tuition, foregone earnings, and other costs of college attendance. For purposes of estimation and hypothesis testing, this general view of enrollment determination is expressed in the following model:

$$E_{it} = B_0 + B_1 X_{1t} + B_2 X_{2t} + B_3 X_{3it} + B_4 X_{4t} + B_5 X_{5t} + B_6 X_{6t} + U_{it}, \quad (1)$$

where $i = 1, \dots, N$ colleges, $t = 1, \dots, T$ years, and

E_{it} = total undergraduate enrollment at the i^{th} ILA in year t , measured as the headcount of full-time and part-time students enrolled in the fall term.⁶

X_{1t} = beginning monthly earnings of college graduates divided by the consumer price index, a measure of conditions in the LMCG.⁷

X_{2t} = average monthly earnings of full-time U.S. workers divided by the consumer price index, a measure of income opportunities foregone while attending college.⁸

X_{3it} = annual tuition plus mandatory fees divided by the consumer price index, a measure of the direct costs of attending the i^{th} college.⁹

X_{4t} = total enrollment at all public institutions of higher education in Iowa and Illinois divided by total ILA enrollment in Iowa and Illinois for each year of the sample period, a measure of the competition from public colleges and universities that led to the expansion of public sector relative to private sector college enrollment.¹⁰

X_{5t} = total number of inductions into the armed services divided by the population of 18-26 year-olds in the U.S., a measure of military draft pressure, which may provide motivation to attend college.¹¹

X_{6t} = resident population of 18-24 year-olds in Iowa and Illinois.¹²

U_{it} = an error term indicating the multiple by which enrollment would change due to factors other than X_1 , X_2 , X_3 , X_4 , X_5 and X_6 .

The coefficients B_1 , ..., B_6 are the elasticities of enrollment with respect to each of the independent variables; B_0 is a scale factor that measures the influence of factors other than the specified variables.

Dividing E_{it} by E_{it-1} , where E_{it-1} is defined by equation 1 with all variables lagged 1 period (year), and taking logarithms yields:

$$\begin{aligned} \ln \left(\frac{E_{it}}{E_{it-1}} \right) = & B_1 \ln \left(\frac{X_{1t}}{X_{1,t-1}} \right) + B_2 \ln \left(\frac{X_{2t}}{X_{2,t-1}} \right) + B_3 \ln \left(\frac{X_{3it}}{X_{3i,t-1}} \right) \\ & + B_4 \ln \left(\frac{X_{4t}}{X_{4,t-1}} \right) + B_5 \ln \left(\frac{X_{5t}}{X_{5,t-1}} \right) + B_6 \ln \left(\frac{X_{6t}}{X_{6,t-1}} \right) + \ln \left(\frac{U_{it}}{U_{i,t-1}} \right) \quad (2) \end{aligned}$$

Since logs of ratios measure percentage changes, equation (2) can be written:

$$\dot{e}_{it} = B_1 \dot{x}_{1t} + B_2 \dot{x}_{2t} + B_3 \dot{x}_{3it} + B_4 \dot{x}_{4t} + B_5 \dot{x}_{5t} + B_6 \dot{x}_{6t} + \dot{u}_{it} \quad (3)$$

where $\dot{\cdot}$ denotes percentage change. Equation 3 expresses in terms of changes the same hypotheses about enrollment determinants as equation 1: the enrollment change that a particular college experiences over a particular period depends on concurrent changes in the variables $X_1, \dots, X_6$.

The unspecified influences on enrollment change, represented by $\dot{u}_{it}$ in equation 3, may vary systematically from one college to another; enrollment growth may be on the average higher for some schools than for others. To test for this possibility, binary variables can be added to equation 3 as follows:

$$\dot{e}_{it} = B_1 \dot{x}_{1t} + B_2 \dot{x}_{2t} + B_3 \dot{x}_{3it} + B_4 \dot{x}_{4t} + B_5 \dot{x}_{5t} + B_6 \dot{x}_{6t} + \gamma_1 S_{1t} + \gamma_2 S_{2t} + \dots + \gamma_N S_{Nt} + \dot{v}_{it}, \quad (4)$$

where $S_{it} = 1$ if the observation is for the i^{th} college and $S_{it} = 0$ otherwise,

$\gamma_1, \gamma_2, \dots, \gamma_N$ are institution-specific rates of change, and

$\dot{u}_{it} = \dot{v}_{it} + \gamma_i$. These intercept coefficients measure and control for the effects of institutional characteristics that vary across colleges but are stable over time for each particular college, such as the presence or absence of competing institutions within commuting distance, the advantages of an urban location, or the perceived quality and admissions standards of an institution.

The notion that institutional characteristics affect the sensitivity of enrollment to conditions in the LMCG can be expressed by making the elasticity of enrollment with respect to market conditions, B_1 , a function of curriculum and selectivity, as follows:

$$B_{1t} = A_0 + A_1 Y_{1it} + A_2 Y_{2it} \quad (5)$$

where B_{1t} = the elasticity of total undergraduate enrollment with respect to the real beginning earnings of college graduates at the i^{th} college in year t , a measure of the responsiveness or sensitivity of enrollment to conditions in the LMCG.

Y_{1it} = the fraction of total bachelor's degrees conferred by the i^{th} college in period t in occupational fields that experienced growth in the 1970s.

Y_{2it} = a binary variable that is 1 for a selective college and 0 for a non-selective college.

A_0 = the value of B_{1t} , when $Y_{1it} = Y_{2it} = 0$; the elasticity of enrollment with respect to conditions in the LMCG for a non-selective college conferring no degrees in occupational fields with expanding student markets.

A_1 = the effect of occupational studies (measured by Y_{1it}) on the elasticity of enrollment with respect to conditions in the LMCG.

A_2 = the effect of selectivity (measured by Y_{2it}) on the elasticity of enrollment with respect to conditions in the LMCG.

Substituting the right-hand side of equation 5 for B_{1t} , in equation 4 yields

$$\begin{aligned} \dot{e}_{it} = & A_0 \dot{x}_{1t} + A_1 Y_{1it} \dot{x}_{1t} + A_2 Y_{2it} \dot{x}_{1t} + B_2 \dot{x}_{2t} \\ & + B_3 \dot{x}_{3t} + B_4 \dot{x}_{4t} + B_5 \dot{x}_{5t} + B_6 \dot{x}_{6t} + \gamma_1 S_{1t} \\ & + \gamma_2 S_{2t} + \dots + \gamma_N S_{Nt} + \dot{v}_{it} \end{aligned} \quad (6)$$

The main research hypotheses can now be stated in terms of the parameters of equation 6. We tested the hypotheses: $A_1 < 0$ and $A_2 < 0$ --that the

sensitivity of enrollment to conditions in the LMCG is inversely related to both the fraction of total bachelor's degrees conferred in occupational fields with expanding student markets and to the selectivity of an institution's admission.

Recalling that $\dot{e}_{it}$ is defined as $\ln E_{it} - \ln E_{it-1}$, equation 6 can be rewritten to show that it explains enrollment levels as well as the year-to-year change in enrollment:

$$\ln E_{it} = \ln E_{it-1} + A_0 \dot{x}_{1t} + A_1 Y_{1it} \dot{x}_{1t} + A_2 Y_{2it} \dot{x}_{1t} + B_2 \dot{x}_{2t} + B_3 \dot{x}_{3t} + B_4 \dot{x}_{4t} \quad (6a)$$

$$+ B_x \dot{x}_{5t} + B_6 \dot{x}_{6t} + \gamma_1 S_{1t} + \gamma_2 S_{2t} + \dots + \gamma_N S_{Nt} + \dot{v}_{it}.$$

Equation 6a states that a college's current enrollment level is equal to its enrollment in the previous year adjusted for changes in factors and conditions that influence enrollment levels.

The HEGIS Taxonomy of Instructional Programs in Higher Education lists 24 conventional academic subdivisions or major fields of study in which a bachelor's degree is conferred.¹³ See Exhibit 1. For this study, a field is classified as "arts and sciences" if it represents a major field of study that is organized along disciplinary lines. A field is classified as "occupational" if it represents a major field of study that is organized along functional lines -- if completion of such a program means the development of skills in the synthesis and application of several disciplines to task performance and problem-solving in a specific occupational context. Majors in multi-disciplinary studies (such as psychology and the humanities), area studies (such as Asian studies), and pre-professional majors are classified as "other studies".

Exhibit 1. HEGIS Taxonomy of Instructional Programs
in Higher Education

Arts and sciences

- | | |
|------------------------|----------------------|
| 1. Biological Science | 5. Mathematics |
| 2. Fine & Applied Arts | 6. Physical Sciences |
| 3. Foreign Languages | 7. Psychology |
| 4. Letters | 8. Social Sciences |

Occupational

- | | |
|--|-------------------------------|
| 1. Agriculture & Natural Resources | 6. Education |
| 2. Architecture & Environmental Design | 7. Engineering |
| 3. Business & Management | 8. Health Professions |
| 4. Communications | 9. Home Economics |
| 5. Computer & Information Sciences | 10. Library Science |
| | 11. Military Science |
| | 12. Public Affairs & Services |

Other studies

- | | |
|------------------------------|--------------------------------|
| 1. Area Studies | 3. Law (Pre-Professional) |
| 2. Interdisciplinary Studies | 4. Theology (Pre-Professional) |

Growth fields are defined as those experiencing an increase in their share of total degrees conferred in the U.S. between 1970 and 1979. For the sample colleges, the only occupational fields not meeting this criterion were education and library science.¹⁴

The sample colleges conferred most of their bachelor's degrees in traditional arts and sciences and teacher training fields, and occupational fields with expanding student markets. Some degrees were also conferred in "other studies" and a small number in library science which, like education, experienced a decline in its share of earned degrees conferred in the nation between 1970 and 1979. For purposes of measurement, degrees in library science and other studies were included with arts and sciences and teacher training.¹⁵

The sample of colleges includes all ILAs in Iowa and Illinois.¹⁶ The data employed in estimating the enrollment equations are observations on $N = 64$ cross-section units (sample colleges) over $T = 16$ periods of time (sample years 1966-1981).

The 64 sample colleges were classified as either liberal arts or comprehensive colleges by the Carnegie Commission on Higher Education (1973 and 1976). The Commission further classified a liberal arts college as selective if it scored 1030 or more on Astin's selectivity index (1977) or was among the top 200 baccalaureate-granting institutions in terms of numbers of graduates receiving Ph.D.'s at 40 leading universities from 1920-1966. Astin used the average SAT composite (verbal plus mathematical) or ACT composite converted to an SAT scale of entering freshmen as an estimate of an institution's selectivity. Procedures and sources used by Astin (1977) were used in the present study to obtain similar selectivity estimates for the 17 comprehensive colleges in the sample.¹⁷

RESULTS

Table 1 presents the parameters of equations 4, 6, and 6a estimated from the pooled sample (64 colleges, 16 years). Results for equation 4 are comparable to the findings of previous enrollment studies. Tests indicate that enrollment at independent liberal arts colleges is significantly and directly related to beginning real earnings of college graduates (X_1) and the population of 18-24 year-olds (X_6) and significantly and inversely related to real tuition and fees (X_3). Although not statistically significant, the estimated coefficients for forgone earnings (X_2) and the ratio of public sector to ILA enrollment (X_4) have the expected negative signs, while the coefficient of the military draft variable has the expected positive sign.

The estimates of the sensitivity of enrollment to labor market changes produced in previous studies and in equation 4 of this study assume that enrollment at all colleges is equally sensitive to changing conditions in the LMCG. That is, in equation 4, the coefficients on the curriculum-labor market and the selectivity-labor market interaction variables are restricted to zero. Equation 6 does not employ these restrictions. An F-test indicates that the curriculum and selectivity coefficients are significantly different from zero at the level of .05, supporting the hypothesis that the sensitivity of enrollment to changes in the LMCG varies systematically across colleges according to an institution's curriculum and selectivity. Specifically, the sensitivity of enrollment to labor market changes is inversely related to 1) the fraction of bachelor's degrees conferred in occupational fields experiencing growth in the 1970s and 2) the selectivity of an institution.

From the coefficients of equation 6 in Table 1, the partial derivative of the percentage change in total enrollment with respect to the percentage

Table 1. Ordinary Least Squares Estimates of Parameters
of Equations 4, 6, and 6a from Pooled Data.^a

Independent Variable ^b	Regression coefficients and (standards errors) for:			Standardized regression coefficients for Equation 6
	Eq. 4	Eq. 6	Eq. 6a	
$\ln E_{it-1}$ -lagged enrollment	-	-	.90* (.02)	-
$\dot{x}_1$ - college salary	.49* (.14)	.96* (.24)	1.00* (.23)	.25
$\dot{x}_1 Y_1$ - college salary x occupational degree share	-	-1.65* (.70)	-1.87* (.68)	-.12
$\dot{x}_1 Y_2$ - college salary x selectivity index	-	-.34 (.24)	-.32 (.24)	-.05
$\dot{x}_2$ - worker salary	-.11 (.17)	-.09 (.17)	-.11 (.16)	-.02
$\dot{x}_3$ - real tuition and fees	-.23* (.05)	-.23* (.05)	-.22* (.04)	-.17
$\dot{x}_4$ - ratio of public to private enrollment	-.06 (.07)	-.06 (.07)	-.06 (.07)	-.03
$\dot{x}_5$ - proportion inducted	.01 (.01)	.01 (.01)	.01 (.01)	.06
$\dot{x}_6$ - population age 18-24	.41* (.16)	.41* (.16)	.41* (.16)	.09
R^2	.180	.186	.983	
Degrees freedom	919	917	916	

^aAll equations include the institution-specific intercept terms as well as the variables listed in this table. These intercept terms are not reported in the interest of brevity.

^bIndependent variables are the annual percentage changes in $X_1, \dots, X_6$ defined on p. 2-3 above and the interaction terms, $\dot{x}_1 Y_1$ and $\dot{x}_1 Y_2$, defined on p. 5.

*Indicates variable is statistically significant at .05 or higher level on a two-tail test.

change in starting salaries of graduates ($\dot{x}_1$) measures the elasticity (responsiveness) of enrollment with respect to conditions in the LMCG:

$$\text{ELAST}_{it} = \begin{matrix} .96 \\ (.24) \end{matrix} - \begin{matrix} 1.65Y_{1it} \\ (.70) \end{matrix} - \begin{matrix} .34SY_{2it} \\ (.24) \end{matrix} \quad (7)$$

To illustrate the relationship between curriculum, selectivity, and the elasticity of enrollment with respect to conditions in the LMCG equation 7 is graphed in Figure 1. The curriculum measure (Y_1) is represented on the horizontal axis and elasticity of enrollment (ELAST) is measured on the vertical axis.

The coefficients of equation 7 can be interpreted as follows: for non-selective colleges ($Y_2 = 0$) without occupational programs ($Y_1 = 0$), the elasticity of enrollment with respect to conditions in the LMCG is estimated to be .96: a one percent decrease (increase) in beginning real earnings of graduates is associated with a .96 percent decrease (increase) in enrollment. From this maximum, ELAST for non-selective colleges declines as the percentage of degrees conferred in occupational programs increases; when $Y_1 = .1, .2$, or $.3$ the estimated elasticity is .8, .63, and .47, respectively. If $Y_1 = .58$, the estimated elasticity is zero, implying that enrollment is insulated from the effects of changing conditions in the LMCG.

When Y_1 exceeds .58, the estimated elasticity of enrollment is negative. In this case, enrollment moves opposite to conditions in the LMCG, decreasing during periods of market improvement and increasing when conditions in the LMCG deteriorate. For example, if $Y_1 = .70$, a 1 percent decrease (increase) in real earnings of graduates is associated with a .20 percent increase (decrease) in enrollment.

Although the selectivity variable itself is not statistically significant, its coefficient has the expected negative sign. A value of $-.34$ means that ELAST for selective colleges ($Y_2 = 1$) is .34 less than ELAST for non-selective

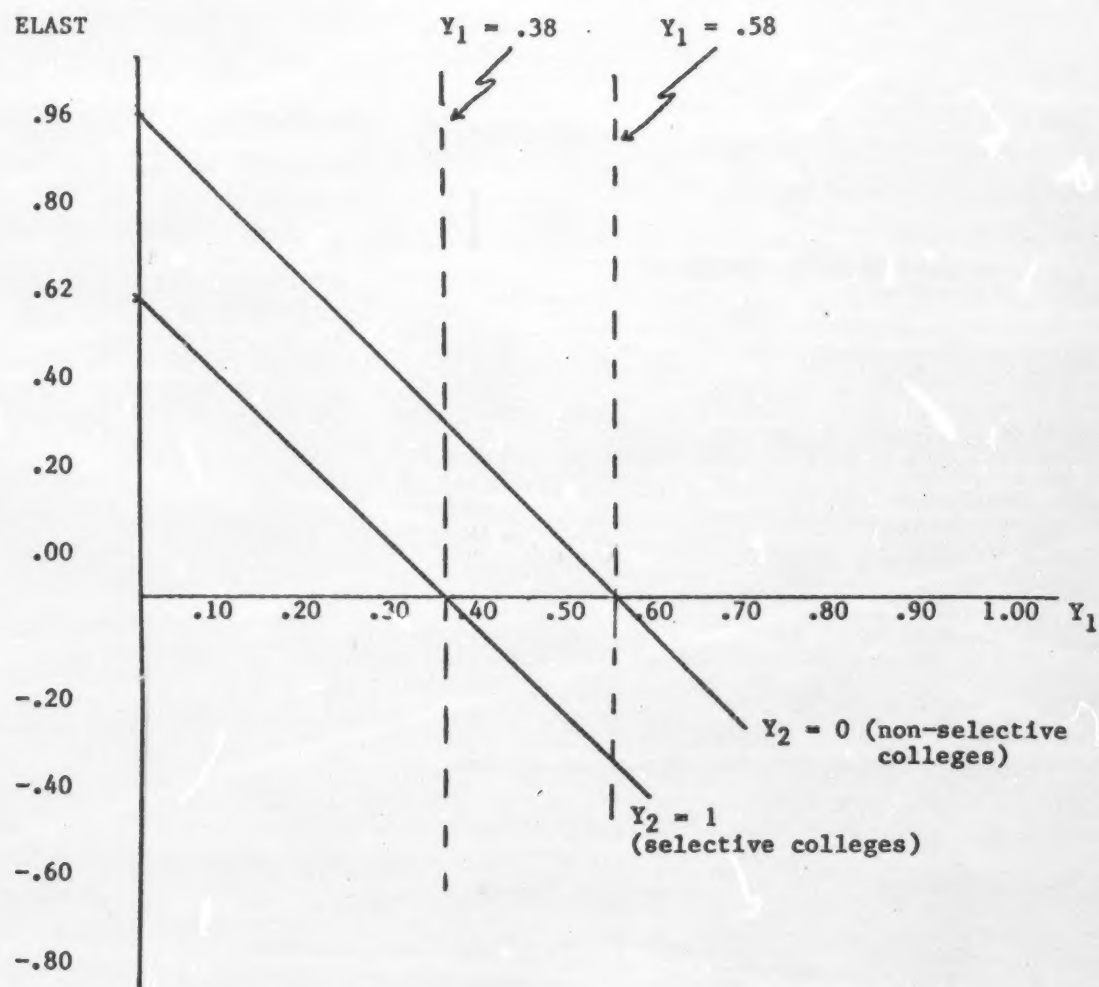


Figure 1: The Relationship Between Elasticity, Curriculum, and Selectivity.

colleges, all else equal. For a selective college with no occupational programs ($Y_1 = 0$), ELAST is estimated to be .62. The estimates imply that selective colleges need confer only 38 percent of their degrees in occupational fields in order to insulate their enrollment from the effects of market changes; ELAST is positive for selective colleges with $Y_1 < .38$ and negative for colleges with $Y_1 > .38$.

The magnitudes of the estimated regression coefficients alone do not directly indicate the importance of each explanatory variable in determining enrollment. Standardized regression coefficients are adjusted for variation in the independent variables relative to enrollment variation. With this adjustment, a comparison of the absolute values of these coefficients shows their relative importance in explaining enrollment variation. The standardized regression coefficients for equation 6 are given in Table 1. The most important variable in the explanation of enrollment change is beginning real earnings of graduates with a coefficient of .25; next most important is direct costs with a coefficient of -.17; etc.

Equation 6a was estimated without restricting the coefficient of $\ln E_{it-1}$ to be 1.0, with results presented in Table 1. This equation explains enrollment levels as opposed to enrollment changes. The very good fit of equation 6a, $R^2 = .98$, suggests that it would be a satisfactory model for forecasting enrollment levels, with the most important predictor of enrollment in a particular year being enrollment in the previous year. The coefficients of the other explanatory variables are essentially the same as those estimated for equation 6.

The estimated parameters of equations 4, 6, and 6a include the values of γ_i , $i=1, \dots, N$, as well as the coefficients reported in Table 1. These institution-specific average growth rates account for a significant share

(about 13 percent) of the observed variation in rate of enrollment change. Furthermore, to the extent that the institution-specific explanatory variables [tuition and fees (X_3), curriculum (Y_1), and selectivity (Y_2)] are stable over time within institutions, their effects on enrollment may be reflected in the estimated values of the γ_i rather than in the estimates of B_1 , A_1 , and A_2 reported in Table 1. Thus, the latter estimates may understate the full effects of tuition, curriculum and selectivity on enrollment.

Although in the interest of brevity the estimates of γ_i will not be reported in detail, some summary statements about them seem warranted. The estimates of γ_i for 27 of the 64 colleges are negative. That is, institution-specific factors appear to generate negative enrollment trends for 27 colleges and positive trends for 37 colleges. The average trend across all colleges is slightly positive. Among selective colleges 10 of 22 have negative trends while 17 of 42 non-selective colleges have negative trends. Only 24 percent of the colleges classified as comprehensive by the Carnegie Commission On Higher Education have negative trends, while 49 percent of the colleges classified as Liberal Arts have negative trends.

POLICY IMPLICATIONS: CURRICULUM STRATEGIES

The results of this study suggest that a college's enrollment response to labor market changes depends on its curriculum and its selectivity. For a given selectivity classification, a college tends to be better off having a low value of Y_1 (emphasize traditional arts and sciences and teacher training programs) when labor market conditions are improving. On the other hand, a college tends to be better off having a high value of Y_1 (emphasize occupational fields with expanding student markets) when labor market conditions are deteriorating. Therefore, heavy emphasis on occupational fields may not be the best curriculum strategy under all labor market

conditions--only when the market for college graduates is deteriorating or poor.

Table 2 shows the predicted rates of enrollment change following from 10 percent increases and 10 percent decreases in the real earnings of graduates under alternative curriculum strategies. For a non-selective college, a value of Y_1 of .58 insulates enrollment from the effects of labor market changes in that the elasticity or sensitivity of enrollment with respect to labor market changes is zero; that is, enrollment is unaffected by labor market changes. A college could thus follow a "hedging" strategy by dividing its enrollment fairly evenly between occupational studies and the traditional arts and sciences. Occupational programs limit the downside risk of declining enrollment when conditions in the LMCG deteriorate, but they also limit expansion of enrollments when the LMCG improves.

On the other hand, if a college is willing to accept downside risk, it can follow a strategy that increases its potential for enrollment growth. When pursuing such a "gambling" strategy, the appropriate curriculum depends on what is expected to happen in the labor market for college graduates (LMCG). If conditions in the LMCG are expected to deteriorate, then an emphasis on occupational studies would be the appropriate strategy, e.g., $Y_1=.75$. If market conditions are expected to improve, then emphasis on the traditional arts and sciences would be appropriate, e.g., $Y_1=.25$.

During the 1970s, some ILAs followed a policy of strict adherence to traditional arts and sciences curricula ($Y_1=0$), implicitly pursuing a gambling strategy. In choosing one of the extremes in curriculum, they chose not to insulate themselves from the effects on enrollment of labor market changes. Such a strategy may well have slowed their enrollment growth or decreased enrollment as conditions deteriorated in the LMCG. However, when conditions

Table 2. Predicted Rates of Enrollment Change for
Alternative Curriculum Strategies^a

Curriculum strategy	Predicted rate of enrollment change when real earnings of college graduates:			
	decrease by 10%		increase by 10%	
	selective	non-selective	selective	non-selective
1. Gambling with arts and science emphasis: $Y_1=.25$	- 2.1%	-5.5%	2.1%	5.5%
2. Hedging: $Y_1=.58$ for non- selective and $Y_1=.38$ for selective	0	0	0	0
3. Gambling with occupational studies emphasis: $Y_1=.75$	6.2%	2.8%	-6.2%	-2.8%

^aEntries in the enrollment "payoff" matrix are calculated from the coefficients of equation 6 assuming that no variables other than earnings (X_1) change.

in the LMCG improve, such colleges can expect superior growth in enrollment. To illustrate, when real earnings of graduates decrease (increase) by 10 percent, equation 6 predicts an enrollment decrease (increase) of 9.6 percent for non-selective colleges with $Y_1=0$.

Colleges that maintained their liberal arts orientation while conferring some degrees in occupational fields, say $Y_1=.25$, pursued a less risky strategy. Enrollment at such colleges would be less sensitive to the LMCG, since a 10 percent decrease (increase) in real earnings of graduates would decrease (increase) enrollment by only 5.5 percent.

Other colleges developed extensive professional studies programs. The results of this study imply that this strategy should have paid off in the 1970s. When conditions in the LMCG are deteriorating, equation 6 predicts stability or growth in enrollment for colleges that emphasize occupational studies and career preparation. For example, when real earnings of graduates decrease by 10 percent, equation 6 predicts an enrollment increase of 2.8 percent for non-selective colleges having $Y_1=.75$.

The preceding comments are also applicable for selective colleges. A selective college can pursue a hedging strategy with less emphasis on occupational fields than is required for a non-selective college. A value of $Y_1=.38$ would be sufficient on the average to insulate a selective college's enrollment from the effects of labor market changes. As Table 2 shows, if earnings were to fall by 10 percent, enrollment at selective colleges would fall by 2.1 percent if $Y_1=.25$ and rise by 6.2 percent if $Y_1=.75$. This is a smaller decrease and a larger increase than predicted for non-selective colleges. On the other hand, if real earnings were to rise by 10 percent, enrollment at selective colleges would rise by 2.1 percent if $Y_1=.25$ and fall

by 6.2 percent if $Y_1 = .75$. There is a smaller increase and a larger decrease than predicted for similar non-selective colleges.

SUMMARY

The results of this study suggest that a college's enrollment response to labor market changes depends on its curriculum and its selectivity. For a given selectivity classification, colleges with an emphasis on traditional arts and sciences and teacher training programs tend to have greater enrollment growth when conditions in the LMCG are improving. On the other hand, colleges with an emphasis on occupational fields tend to have greater enrollment growth when conditions in the LMCG are deteriorating.

Although higher education administrators cannot control the labor market for college graduates, they can exercise some control over characteristics of their own institutions. This study offers some evidence that appropriate strategies with respect to curriculum and selectivity may limit or offset the adverse enrollment effects of deteriorating conditions in the labor market for college graduates.

The pooled data set used in the study represents the experiences of 64 independent liberal arts colleges over a 16 year period. Estimates of the effects of environmental and institutional factors on enrollment provide measures of "average" experience that might be useful in simulating alternative futures of the independent college. And equation 6a seems to be a reasonable basis for an enrollment forecasting model given that it fits well the observations generated by a broad cross-section of 64 schools over 16 years.

Future research might generate evidence of how other institutional factors, such as tuition and aid, interact with labor market conditions to

offset the adverse enrollment effects of market changes. Such a course would serve to further focus research on the competitive nature of college choice.

Footnotes

1. Bishop (1977); Dresch (1975); Freeman (1975); Handa and Skolnik (1975); Hoenack and Weiler (1979); Hopkins (1974); Tannen (1978); and Wish and Hamilton (1980).
2. These factors include foregone earnings -- Lehr and Newton (1978); and Rusk, Leslie and Brinkman (1982); military draft pressure -- Freeman (1975) and Lehr and Newton (1978); tuition and other direct costs -- Kohn, Manski, Mundel (1974) and Chapman (1979); admissions selectivity -- Fuller, Manski, and Wise (1980), Spies (1978), and Tierney (1980); location of an institution -- Bishop (1977) and Hoenack and Weiler (1979); and curriculum -- Astin, King and Richardson (1980) and Kohn, Manski and Mundel (1974).
3. Glenny (1976:26) and Stadtman (1980:26).
4. Stadtman (1980:142).
5. Independent liberal arts colleges are those private colleges classified as either liberal arts colleges or comprehensive colleges and universities in: Carnegie Commission on Higher Education, Classification of Institutions of Higher Education, Carnegie Foundation for the Advancement of Teaching, 1976.
6. Enrollment at Iowa colleges is from Iowa Association of Independent Colleges and Universities, "Iowa College and University Enrollment," (mimeographed). Enrollment at Illinois colleges is from State of Illinois Board of Higher Education, "Enrollment in Institutions of Higher Education in Illinois," (processed) and "On-Campus Undergraduate Headcount and FTE by Level," (mimeographed). For the six Iowa colleges with post-graduate programs, headcount enrollment, broken down by undergraduate, graduate, and professional status, was obtained from the registrar at each college.
7. The earnings measure is a weighted average of the starting salaries of male college graduates in engineering, general business, accounting, and sales. Weights of .35, .20, .05, and .40 are used to reflect the approximate distribution of graduates in engineering and related sciences, business administration, accounting, and "other" fields, assuming that "sales" jobs represent employment opportunities for graduates in other nontechnical fields. This is the same series employed by R. Freeman in his pioneering work on the college labor market (1975, p. 301n). Others have used this series in successful attempts to replicate and build upon Freeman's work. See especially Wish and Hamilton (1980) and Hoenack and Weiler (1979). Salary data are from F.S. Endicott, The Endicott Report: Trends in the Employment of College and University Graduates, Evanston, Illinois: Northwestern University, 1965-1981. The Consumer Price Index is from Economic Report of the President, Washington, D.C.: Government Printing Office, various editions.

8. This model uses Freeman's measure of earnings forgone as a "price" signal measuring the indirect costs of college. Employment or "quantity" signals also provide information about market opportunities. Experimentation with the unemployment rate of 18-19 year-olds yielded results similar to those for the earnings series used in this model. Earnings data are from U.S. Department of Commerce, Survey of Current Business, various editions.
9. An ideal measure of the direct cost of college would include tuition net of financial aid. In the case of independent liberal arts colleges, scholarship aid is particularly important and shows considerable variability from college to college. Accounting for scholarship aid per student could produce an improved measure of the actual cost of attending a particular college. Unfortunately, sufficient time series observations are not presently available. Tuition at Iowa Colleges is from Iowa Association of Independent Colleges and Universities, "Tuition and Mandatory Fees;" (mimeographed materials); tuition at Illinois colleges is from Illinois State Scholarship Commission, "College Costs," (mimeographed materials).
10. It is difficult to define the form in which competition occurs in a way that makes it measurable. Students may attend competing public institutions for many reasons: tuition, aid, curriculum, accessibility, admissions policies. Due to the limited time series variation in ILA enrollment, all of these forms of competition cannot be directly considered. However, regardless of the various forms that competition takes, what finally matters is how many students choose to attend competing public institutions. Public sector enrollment changes do not indicate the nature of competition, but they are used to measure the composite effect of the various forms of competition.

This measure reflects the effects of factors that influence enrollments in public and private institutions dissimilarly. The labor market variables (X_1 and X_2) may be such factors; if so, their effects should be weaker when X_4 is included than when it is omitted.

State enrollment data are from U.S. Department of Education, National Center for Education Statistics, Digest of Education Statistics. Washington, D.C.: Government Printing Office, 1967-1982. 1981 figures are from Iowa College Aid Commission, "Data Digest on Iowa Postsecondary Institutions," 1981-1982 (processed) and Illinois Board of Higher Education, Data Book on Illinois Higher Education, May 1982 (processed).

11. Data on inductees are from U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, Washington, D.C.: 1977, Table No. 595, 1981, Table No. 610, and U.S. Department of Defense, Selected Manpower Statistics, Fiscal Year 1981, Washington, D.C.: Tables 2-3, pp. 52-53.
12. The U.S. Bureau of the Census publishes state estimates for the 18-24 year-old population for only 1965 and the Census years 1970 and 1980. It publishes state estimates of 18-20 year-olds and national estimates of 18-20 and 18-24 year-olds for every year. The number of 18-24 year-olds in Iowa and Illinois is estimated as follows:

$$P_t = R_t \left(\frac{Z_t}{Y_t} \right)$$

Where P_t = the estimated number of 18-24 year-olds residing in Iowa and Illinois in period t .

R_t = the number of 18-20 year-olds residing in Iowa and Illinois in period t .

Z_t = the number of 18-24 year-olds residing in the U.S. in period t .

Y_t = the number of 18-20 year-olds residing in the U.S. in period t .

Population data are from U.S. Department of Commerce, Bureau of the Census. Current Population Reports, Series P-25. National data for 18-26 year-olds are from No. 519, Table 2 and No. 917, Table 2. State data for 18-20 year-olds are from No. 420, Tables 1 and 5, No. 437, Tables 1 and 5, No. 875, Table 2 and No. 913, Table 1. State data for 18-24 year-olds are from Current Population Reports, Series P-25, No. 375 and Statistical Abstract of the U.S., 1972, Table No. 36, and 1981, Table No. 31.

13. See U.S. Department of Health, Education, & Welfare, National Center for Education Statistics. A Taxonomy of Instructional Programs in Higher Education, Washington: 1970. U.S. Government Printing Office.
14. See U.S. Department of Education, National Center for Education Statistics, Earned Degrees Conferred, 1970-71 and 1978-79.
15. Data on earned degrees conferred are from U.S. Department of Health, Education, and Welfare, National Center for Education Statistics, Earned Degrees Conferred by Institutions of Higher Education by Race, Ethnicity, and Sex: Institution, State, and Nation. Washington, D.C.: Government Printing Office, 1970-71, 1975-76, and 1976-77. Computer printouts of the unpublished data for 1979-80 were purchased from the National Center for Education Statistics. Values for the remaining years between 1965 and 1981 were estimated by interpolation.
16. Two of the Carnegie liberal arts and comprehensive colleges are excluded from the study because they were in existence for only a fraction of the sample period: Maharishi International University in Iowa and Daniel Hale Williams University in Illinois. Two other colleges are excluded for a different reason: Grand View College in Iowa and Kendall College in Illinois. Prior to the 1976 classification, the Carnegie Commission had classified these colleges as private two-year colleges. Therefore, they conferred no bachelor's degrees for much of the sample period. They also had only a modest baccalaureate program in later years.
17. Sources: Carnegie Commission on Higher Education, A Classification of Institutions of Higher Education, Revised Edition, Carnegie Foundation for the Advancement of Teaching: 1976. SAT and ACT scores are from Barron's Profiles of American Colleges, New York: Barron's Educational Series, 1974. Top 200 rankings are from National Research Council, Doctorate Recipients from United States Universities, 1958-1966, Washington, D.C.: National Academy of Sciences, 1967.

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